the requirement for power duty cycling (**Section E.2.6**). **Section F.3 describes science impacts on mission operations. Section F.14 provides more detail on mission design.**

To optimize data quality and greatly enhance scientific return, the SMART payload will generate two science data streams, Survey (with a Slow and Fast mode) and Burst. Burst data are high-time resolution, piecewise continuous data sets that are selected by either an on-board trigger system or time-tagged command (see **Table E-2**).

The instruments will be in Slow Survey mode when the spacecraft are ***not*** in or near targeted regions of scientific interest (determined by orbital phase and time-tagged command). During such times the instruments transfer less than maximum data rates to the CIDP. As the spacecraft enter scientifically targeted regions, they are configured into Fast Survey mode to acquire a full data set at moderate time resolution to determine the context of the targeted region. In Fast Survey mode, all instruments provide burst data to the CIDP, but the data are not necessarily retained.

The burst data scheme, which implements simultaneous capture of high-resolution particle and wave data, works as follows. Each of the fields and particle instruments supplies a continuous stream of burst data to the CIDP, where it is directed into two or more buffers. When a trigger occurs, i.e., during an event of scientific interest, the data are captured for transfer to the spacecraft, including data acquired prior to the trigger. The data are compressed and transferred from the CIDP to the spacecraft recorder at a much slower rate (~100 kbit/s). This scheme focuses data collection on the most interesting parts of the orbit and optimizes the 2-Gbit on-board storage supplied by the spacecraft.

The trigger system is key to a successful unified burst system. Employing a system designed after that used on FAST (R. Ergun, designer), each of the instruments creates a composite, low-rate stream of "trigger" data continuously fed to the CIDP. Using several algorithms, each with a specific scientific focus, the

Table E-2. (revised) ***SMART instrument telemetry data rates***

Instrument	Instrument Data Rate Allocation to CIDP (kb/s)			CIDP Lossless Compression Factor			CIDP Data (kb/s)		
	Slow Survey	Fast Survey	Burst	Slow Survey	Fast Survey	Burst	Slow Survey	Fast Survey	Burst
Fast Plasma - Electrons	0.13	4.10[a]	700.00[c]	NA	NA	NA	0.13	4.10	700.00
Fast Plasma - Ions	0.13	4.10[a]	100.00[b]	NA	NA	NA	0.13	4.10	66.67
Fields	0.80	8.00[d]	796.00[e]	1.50	1.50	1.50	0.53	5.33	530.67
Ion Composition	0.00	2.80	60.00	1.50	1.50	1.50	0.00	1.87	40.00
Energetic Particles	0.00	2.00	36.00	1.50	1.50	1.50	0.00	1.33	24.00
Trigger	0.00	0.25	0.00	1.00	1.00	1.00	0.00	0.25	0.00
Housekeeping	0.50	0.50	0.00	1.00	1.00	1.00	0.50	0.50	0.00
Total Rate	1.06	21.24	1,692.00				0.79	16.98	1394.67
Duty Cycle[f]	60%	40%	1.22%				60%	40%	1.22%
Orbit Averaged Rate	0.63	8.50	20.64				0.42	5.70	17.03
						Daily Stored Data Volume (Mb):	36.29	492.48	1471.23

a) $20^o x20^o$, 64-energy electron and ion distributions at 12 second resolution.
b) $10^o x10^o$, 64-energy distributions. Sub-sampled distributions (32 Energy at $20^o x20^o$) at 63 ms resolution. Full ions 500 ms resolution.
c) $10^o x45^o$, 16-energy electron distributions at 8 ms resolution. $10^o x11.3^o$ at 25 ms resolution.
d) 32 vectors/s E and B, 12 s resolution on spectra.
e) 1 ms on E, 0.1 s resolution on spectra. Includes 63 μs resolution wave forms and 4 μs wave forms at lower duty cycle.
f) 1.22% burst duty cycle provides 17.5 minutes of burst data per day.